

[002] This application is a national stage completion of PCT/EP2003/012585 filed November 11, 2003, which claims priority from German Application Serial No. 102 53 471.3 filed November 16, 2002.

[003] FIELD OF THE INVENTION

[004] The invention relates to a shifting device ~~with the characteristics of the~~
~~preamble of patent claim 1.~~

[005] BACKGROUND OF THE INVENTION

[017] SUMMARY OF THE INVENTION

[048] BRIEF DESCRIPTION OF THE DRAWINGS

[049] The invention is ~~best explained with concrete examples as shown in the~~
~~attached drawings.~~ will now be described, by way of example, with reference to
the accompanying drawings in which:

[067] DETAILED DESCRIPTION OF THE INVENTION

[083] The gearshift frames 14, 15, 16, 17 each have a recess 9 at their opening, in which one of the respective shift fingers 2, 3, 4, 5, 6, 7, 8 can engage coaxially to directional arrow 18 in an axial displacement of the shift finger shaft 1. By swivelling the shift finger shaft 1 around its longitudinal axis, according to the directional arrow 19, one or several of the shift fingers 2, 3, 4, 5, 6, 7, 8 displace one or several of the gearshift frames 14, 15, 16, 17 with the sliding selector shafts 10, 11, 12, 13, 56, 57, 58, 59 attached to them, which displaces the sliding collars mentioned above in an axial manner. By systematically positioning the shift fingers 2, 3, 4, 5, 6, 7, 8 on the gearshift shaft 1, a reverse gear RG of the transmission, for example, can be activated through shift finger ~~[[9]]~~ 8, the gearshift frame 14 and the sliding selector shaft 56.

[096] As shown in Fig. 9, for shifting from the fifth gear G5 into the sixth gear G6, the shift finger shaft 1 is displaced axially according to directional arrow 18 in the openings of the gearshift frames 16, 17 in such a way that shift fingers 4, 6 engage into the recesses of the gearshift frames 16, 17 assigned to them. A swivelling of the shift finger shaft 1 to the right according to directional arrow 19 has the result, that the gearshift contour 28 of the shift finger 6 lies against the gearshift contour of the gearshift frame 17 (Fig. 6). In order to put the car into sixth gear G6, the gearshift contour 28 transports gearshift frame 17 together with the sliding selector shaft 59 to the left, from a neutral position into the shifting position, whereas the shift finger 4 engages with its gearshift contour into the gearshift contour of the gearshift frame 16 and displaces this gearshift frame 17 to the right for taking out the fifth gear G5. ◆

[098] However, this Fig. 10 also indicates, that the right side of the gearshift frame 14 may also be connected with a sliding selector shaft 10 through which, for example, the seventh gear G7 of a seven-gear transmission can be shifted. For this purpose, merely an additional recess has to be positioned in the gearshift frame 14 and an additional shift finger has to be positioned on the shift finger shaft 1. ◆

[101] For shifting the first or third gear, the shift finger shaft 1 is displaced axially the distance of the component width 84 in direction 18 by one shift finger width, so that for shifting the first gear, a shift finger 65 can insert itself into a recess 67 of the gearshift frame 61, and the gearshift shaft can be swivelled axially. For putting the transmission into third gear, the shift finger shaft 1 is kept axially at the same position and is swivelled into the opposite direction according to directional arrow 19, so that a shift finger (not shown here) can penetrate a recess 64 of the gearshift frame 61 and displace it to the right. ◆

- [102] With respect to the catch stop geometry, the illustration of a gearshift frame 68 in Fig. 12 clarifies that the surface contours 71, 72, 73 of the catch stops [[71]] 69, [72]] 70, apart from their function to release a shift finger for penetrating into the gearshift frame, also influence the shifting geometry, through which a gearshift lever can be displaced in its gearshifting gate. ❖
- [109] Another development (Figs. 17, 18) of the invention suggests to only have one shift finger 103 to actuating a gearshift package or to put the transmission in or out of two gears (for example, gear five and six) and acts together with gearshift frame 107. The gearshift frame 107 has sliding selector shafts 108 and 109. In neutral position, the shift finger 103 is in recess 112 of the gearshift frame 107 and the locking fingers 105, 106 lock catch stops 110, 111, so that the gearshift frame 107 cannot be displaced. When turning a shift finger shaft 102 in the direction of rotation 115, the shift finger 103 swivels into recess 112 to the left, so that the gearshift frame 107 is displaced in direction 116 and the fifth gear is put in. Ramps 108 and 109 aid in the insertion of the shift finger into the recess. During this swivel movement of the shift finger shaft 102, the locking finger 105 swivels into a level in front of a stop catch 110. A shift finger 104, as well as the locking finger 106, is not engaged when the fifth gear is put in. ❖
- [111] In the Figs, 19 to 22 below, we illustrate another interesting aspect of the invention, which makes four gears shiftable by way of two shift fingers. Characteristic for such a design of the shifting device are two gearshift frames 121, 122 arranged closely together, which act together with two shift fingers 118, 129 that are positioned axially staggered to each other on a shift finger shaft 117. Such a shifting device may be used when, for example, the odd-numbered gears one, three, five (seven) are situated this way on an input shaft and the even-numbered gears two, four, six, as well as the reverse gear are situated this way on the other input shaft. In the neutral position shown in Fig. 19, the shift finger 118 is in a recess 124 for the first gear, whereas locking fingers 119, 120 are in contact with a catch stop 123[[],] and the recess 124, making the gearshift frame 121 fixed and not displaceable. For example, to put ❖

the engine into first gear, the shift finger shaft 117 is rotated in the direction of rotation 127, so that, on the one hand, the locking fingers 119, 120 release the catch stop 123 and the recess 124 with the aid of ramp 126 and, on the other hand, the shift finger 118 displaces the gearshift frame 121 in direction 128 so that the first gear is put in (Fig. 19).

[113] For putting the engine into third gear (Fig. 20), the shift finger shaft 117 is moved by one shift finger width axially in direction 130. Thus, the shift finger 118 and locking fingers 119, 120 disengage from the corresponding recesses 124 and catch stop 123[[, 124]], and thereby are on the same level in front of the gearshift frame 121. The “back” shift finger 129 can thereby insert itself into a recess 125 for the third gear. By swiveling the shift finger shaft 117 in direction 127, the shift finger 129 swivels the gearshift frame 121 in direction [[131]] 130 to the right so that the third gear can be put in. To take out the third gear, the reverse happens against the demonstrated direction of rotation 127. ◆

[115] For shifting the seventh gear (Fig. 22), the shift finger shaft 117 is shifted by one shift finger width in direction 130 in such a way that the shift finger 129 inserts itself into the recess 125 of the gearshift frame 122. This way, the locking fingers 131, 132 are in contact with catch stops 133, 134 of the gearshift frame 122. By rotating the shift finger shaft 117 in clockwise direction 127, the gearshift frame 122 is shifted to the left in direction [[131]] 130, and the seventh gear is put in. Taking out of the fifth or seventh gear takes place as described, but in reverse sequence. ◆